Dr. N. F. H. Bright

CANADA

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MINES BRANCH

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MINERAL SCIENCES DIVISION

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ATTENDANCE AT THE AMERICAN PHYSICAL SOCIETY MEETING HELD AT WASHINGTON, D.C., APRIL 26 to 28, 1965

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The author attended the spring meeting of the American Physical Society held as usual in Washington, D.C., at the Shoreham and Sheraton-Park hotels and presented a paper on "The Mössbauer Study of Single Crystal Iron Sulphide (Pyrite)". In the ensuing discussion, questions were asked concerning the continuous converter and programing procedures, and Dr. Artman of the Carnegie Institute of Technology expressed interest in the possibility of measuring the nuclear quadrupole moment, Q, of iron-57 using iron pyrite as a matrix. In answer to this question, it was stated that in the author's opinion this is not a particularly good material with which to do Q measurements and it would be preferable to do these measurements with an electric field gradient beam device. This question arose since there seems to be some discrepancy in the value of the quadrupole moment of iron-57 but the accepted value of 0.28 barns is used by most people. Another person interested in our experiments is Dr. C. Cook of Philips Petroleum Company, Radiation Laboratory, Bartlesville, Oklahoma.

*Scientific Officer, Mineral Physics Section, Mineral Sciences Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

Dr. Cook has been working with Mössbauer effect on surfaces of silica and alumina. He has been depositing on these surfaces iron ferrocene complexes and iron nitrate and has been studying the Mössbauer effect in a transmission-type experiment. He has observed some asymmetries in the quadrupole splitting which may be interpreted as due to the effects of electric field gradient variations across the surface. This work is continuing.

As usual, it was the sessions of invited papers which were the most rewarding in that they were longer, 30 to 45 minutes, and were by authorities in the field. A paper entitled "A New Laboratory for Physics, How to Work in It", by H.E. Newell, of NASA, was most interesting; it outlined the physics of the current space program. The geodetic shape of our earth has been determined very accurately by means of artificial earth satellites. Using these geodetic probes it has been found that the earth is a few metres higher near Mandalay and is depressed near India. A deviation of about 70 metres from the hydrostatic equilibrium model of the earth has been found at the equator. An interesting study of the phenomena of charged particles interacting with the magnetic dipole of the earth has revealed the existence of the well-known Van Allan Belts, and also a magnetosphere which is caused by the earth moving through this flux of charged particles. This motion produces a shock-wave effect which has been found by the deep probing satellites. The orbiting of the Astronomical Observatory and Geophysical Observatory will further investigation of these phenomena.

The use of earth satellites for astronomy has revealed several hitherto unknown X-ray sources; the energy of emission of these sources is

from 1 to 10 KeV. Dr. Newell also showed pictures of the Ranger VII and discussed the various physics experiments which would be possible on the moon. He suggested that this high vacuum environment would be an ideal place to build the next high-energy accelerator, since many construction problems would be simplified. One very impressive feature of this talk was the excellence of his slides and the presentation. The National Aeronautics and Space Administration seems to devote much effort to this type of information circulation.

A visit was made to the laboratory of Dr. Spijkerman of the National Bureau of Standards. He is doing Mössbauer experiments and is establishing a set of velocity standards for those experiments using sodium nitroprusside; he hopes, within a years time, to supply these as standard velocity spectra for intercalibration purposes. He has built an optical interference velocity measuring device which uses a mercury-vapour lamp for the monoergic light source. The corner cubes for his device were purchased from Perkin Elmer. While Dr. Spijkerman was currently in Vienna, a most interesting discussion of the various techniques employed and the techniques used for analysis took place with one of Dr. Spijkerman's co-workers.

Another interesting invited paper was given by J. Dumond of the team Dumond and Cohen who have done so much work on the fundamental constants. Dr. Dumond started his work in the early 1930's and at this time the internal consistency among the various constants was about .1%. As late as 1955 there were errors of one part in 10,000 in the inter-agreement of the fundamental constants. These errors have now been reduced to less

than 50 parts per million and Dr. Dumond believes that there is probably little improvement in this. There are, besides the actual measurements of the constants, theoretical inter-relationships between them which must be examined in detail. At the level of accuracy discussed in his paper, it is not clear whether it is in fact the measurements or the theory that is causing the disagreement between the results and the predicted values.

A report on a Mössbauer experiment using Coulomb excitation techniques rather than beta decay was discussed by Dr. F.E. Obenshain of the Oak Ridge National Laboratory. He has studied the Mössbauer effect of 67.4 KeV transition of Ni 61 using Coulomb excitation. There are a total of 32 lines in this spectrum and the width is 3.3 mm per second. Fortunately, in most crystalline environments, some of these lines are degenerate in energy; because of this the spectrum frequently contains only 6 to 12 lines. This great abundance of lines comes from the fact that the two states involved have spins 5/2 and 7/2. The effect observed in Coulomb excitation is not as great as the effect observed from beta decay. The reason for this is thought to be the poor geometry of the Coulomb excitation experiments. It was predicted, when Coulomb excitation experiments were initially discussed, that radiation damage cause the Mössbauer fraction to decrease as time progressed. Over a period of some 120 hours Dr. Obenshain observed no significant change in the fraction of Mössbauer effect decays. Though the use of Coulomb excitation has as yet been primarily a duplication of the techniques involved in beta decay, work on sulphur and potassium show the power of this technique in experiments which would not be amenable from

beta-decay sources. However, the cost of performing such an experiment is very much greater than a beta-decay source in that one must have access to a high current particle accelerator.

Dr. L.D. Roberts of the Oak Ridge National Laboratory presented an invited paper on the Mössbauer effect of dilute gold alloys. Because the Mössbauer effect in gold has a rather small Debye-Waller factor, all his experiments were performed at liquid helium temperatures. He studied the effects of nearest neighbours of gold in various alloys of platinum, silver, etc. It has been assumed from electrochemical theory that the gold should assume a different charge in a platinum lattice than in a silver lattice, and therefore one would expect a change in the direction of the isomer shift as a function of this lattice parameter. Thus the evaluation of the Mössbauer spectrum of gold in a platinum and a silver lattice should show a different sign of isomer shift. Because Dr. Roberts at ORNL has performed this experiment and found no difference in sign, this may be interpreted as an indication that the assumed charge effects of gold in these lattices does not exist. Dr. Roberts continued his talk by discussing the correlation between the isomer shift and the electrical resistivity measurements. He found this correlation to be very good and thus one understands that the isomer shift is a measure of the electro-phonon scattering cross-section in this material.

Due to several conflicting conferences in other parts of the United States, the Washington meeting was not as well attended this year as it has been in the past. However, many people who are doing Mössbauer-effect experiments were in Washington and an interesting discussion of the various new techniques was held.

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